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Engineering

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# OFFICIAL PROCEEDINGS
## Meeting of Jan., 1920.

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# Canadian Railway Club
MONTREAL

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REPORT OF JANUARY MEETING.

PAPER AND DISCUSSION ON
"GRAPHIC PRODUCTION CONTROL."

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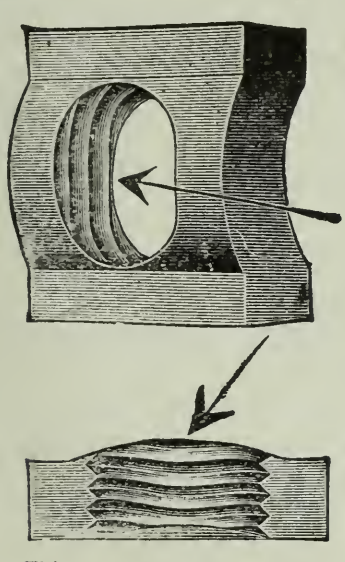

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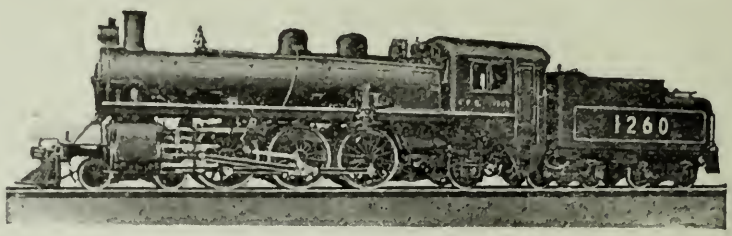


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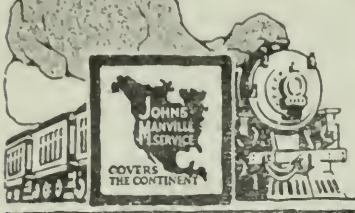


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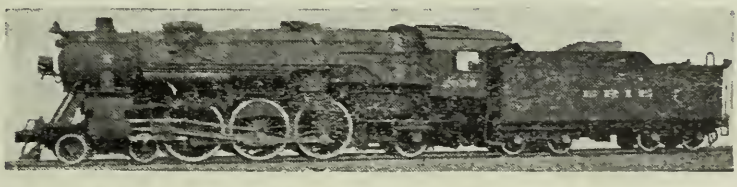

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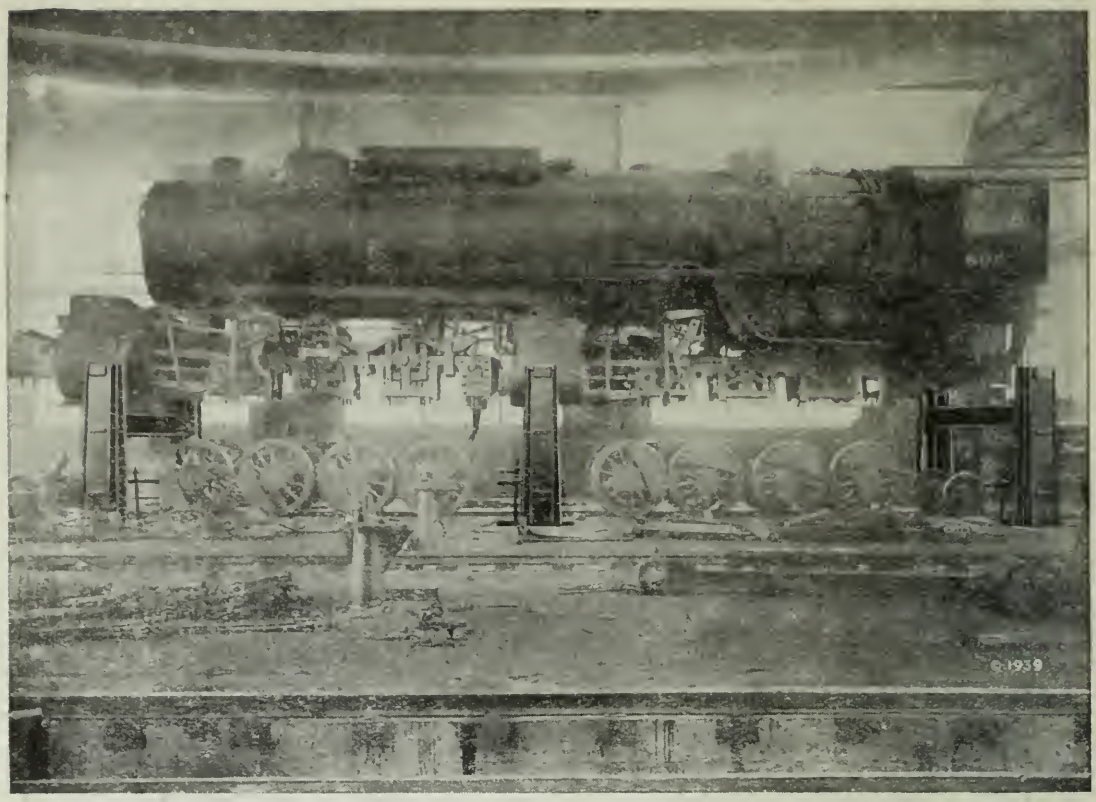

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W. A. BOOTH, Secretary, 131 Charron Street, Montreal.

Vol. XIX.
No 1 **Montreal, Can., Jan. 13, 1920** 25c. per copy

# PROCEEDINGS OF THE CANADIAN RAILWAY CLUB.

Windsor Hotel.
Montreal, Jan. 13, 1920.

Chairman (Mr. J. Hendry):

Gentlemen, come to order, please. The members will kindly sign the cards which they will find in the seats. The first order of business is the reading of minutes of previous meeting. The Secretary states these have been printed and are being mailed to you. It will, therefore, not be necessary to read them. I have no remarks to make just now, but will call on the Secretary to read the list of applications for membership.

Secretary:

Mr. Chairman and Members, the following applications have been received for membership.

## New Members.

Bermingham, T. C., Consolidated Steel Corporation, 263 St. James Street, Montreal.
Carrigan, W. J., Canadian Nathan, Ltd., Hamilton, Ont.
Clark, W., International Mch. & Supplies Co., 421 St. James Street, Montreal.
Crutchlow, Geo., Engineering Service, Ltd., 233 St. James Street, Montreal.
Dohm, J. T., International Mch. & Supply Co., 421 St. James Street, Montreal.
Ferguson, Jas., Asst. Engineer, Can. National Rly., 12 Querbes Ave., Outremont.
Germain, W. R., Station Master, Grand Trunk Rly., Bonaventure Station.
Murray, W. B., Gen. Foreman Frt. Dept. Can. Car & Foundry Co., Montreal.
O'Connell, Geo., Steam Shovel Inspector, Grand Trunk Rly., Toronto, Ont.
Parks, G. E., Mech. Engineer, Michigan Central Rly., Room 447, Michigan Central Terminal, Detroit.

Rodgers, H. L., Mech. Engineer, Temiskaming & Northern Ont. Rly., North Bay, Ont.
Salander, A., Canadian Car & Foundries, Ltd., Montreal
Stevens, E. E., Safety Engineer, Canadian National Rlys., Moncton, N.B.
Weldon, H. T., Asst. Frt. Traffic Mgr., Canadian National Rlys., Montreal.
Wilding, W. A. E., Clerk, Office of Auditor of Stores, Can. Pac. Rly., Angus Shops, Montreal.
Williamson, R. B., Robinson Connector Co. of Canada, Imperial Bank Building, Montreal.

Chairman:

You have heard the applications as read. What is your pleasure?

Mr. E. A. Cunningham:

I move these applications be accepted.

Mr. W. H. Sample:

Seconded.

Chairman:

It has been moved by Mr. Cunningham, seconded by Mr. Sample, that these applications be accepted. All in favor please signify in the usual way.

Carried.

MEMBERS PRESENT.

| | | |
|---|---|---|
| Henry, J. | Cunningham, E. A. | Hunter, W. C. |
| Barrett, C. W. | Cuttle, G. C. | Hyman, W. J. |
| Baxter, J. A. | DeAngelis, G. | Jarman, T. |
| Bergen, F. | Desparois, J. D. | King, Alex. |
| Blackbird, W. | Dyke, H. J. | Kinnear, D. M. |
| Boyer, G. | Ferguson, F. | Lloyd, E. E. |
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| Burns, J. | Gillians, R. H. | Macnab, E. S. M. |
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| Carter, J. W. | Hall, R. E. | McNair, C. |
| Chumley, C. C. | Harrison, E. V. | McNown, W. |
| Crumpton, A. | Holland, N. | Meissner, O. W. |
| Comee, J. F. | Hudson, T. C. | Moore, T. D. |
| Coplan, A. | Hunt, A. | Morris, M. J. |

Murray, W. B.
Needham, R. J.
Nicholson, L. G.
Noakes, R. J.
Nystrom, K. F.
Ogden, J.
Ord, L. C.
Parsons, H. J.
Peacock, G.
Phillips, F.
Pope, A.
Powell, J .
Primeau, J.
Pugh, G. W.
Pyne, R. A.
Riddington, A.
Robertson, A. S.
Rodgers, H.
Rodgers, J. H.
Royer, C.
Sample, W. H.
Shortley, B. F.
Soltau, G.
Spence, W
Spidy, E. T.
Stewart, W. H.
Swan, A. W.
Symmes, H. H.
Taylor, S. G.
Tetlaw, H.
Thomas, E.
Thorp, H. W.
Tinkler, J. E.
Watkin, B.
Weldon, A. T.
Welham, H.
Wilson, G. M.
Winterrowd, W.H.
Booth, W. A.

And others.

Secretary:

I have been requested by the President to make an announcement. Before calling upon Mr. Spidy for his paper we considered it desirable to take a few minutes in order to interview the members as to the sale of tickets for our coming Banquet and thought this would be an opportune time.

Chairman:

As the members have now been canvassed with respect to the sale of tickets, I will call on Mr E. T. Spidy, Assoc. Mem. Am. Soc. Mech. Engrs., Production Engineer, Angus Shops. Canadian Pacific Railway, Montreal, to read his paper on Graphic Production Control.

Mr. E. T. Spidy:

Mr. Chairman, and gentlemen, I have often been asked the question, "What are Production Methods." There appears to be no difficulty in understanding it when you talk about automobile industries, but when you come to apply it to railway work there appears to be a lot of difficulty. It was this idea I had in mind when I undertook to write this paper. I call it "Graphic" because I am a firm believer in putting things down graphically so they can be readily understood and this is the basis for real control.

## "Graphic Production Control."

In the management of any industrial plant, the author has become convinced through plain experience, that apart from

the personality of the management directing affairs and the regular accounting system there is a great necessity everywhere for the placing of facts in such a manner that the condition of affairs *to-day* can be quickly seen in their true relation to the policy of the management.

We are all more or less accustomed to seeing statistics shown graphically. Their value to show what *has happened* is of unquestioned value. We are able to see at a glance for instance how our expenditure on a certain class of output compares with last year and if we plot on the same sheet the amount of our output we are able to see how the cost has varied with the output. Such a diagram is a familiar one and needs no explanation, (sample shown in fig. 1). Endless combinations are made like this, but they all tell you what *is* done. I wish to emphasize this point because upon it hinges the purpose of this paper.

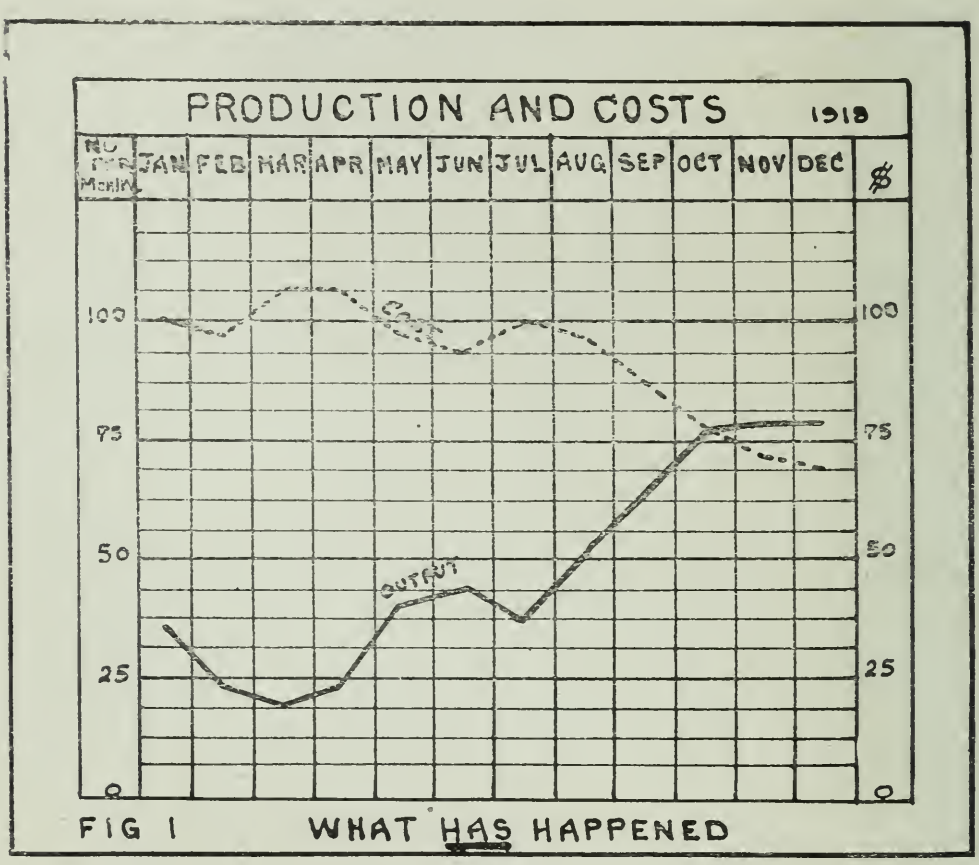



FIG 1 WHAT HAS HAPPENED

I ask you, as departmental heads, do you not on receiving statements, whether in figures or by diagram, often feel that

you have been "let down," so to speak. Let us suppose you have received a statement showing departmental expenses, or a statement of output in which an item shows lower than your expectations or the average. You see a condition that if you had known it was happening, you could have done something, but you didn't, and all you can do now is to investigate and make such changes as your judgment dictates.

After you have received an explanation, called your man down or perhaps replaced him, what guarantee have you that you will not look at an even worse condition next month? The only guarantee you have is your confidence in the man in charge. This confidence I do not for an instant depreciate, because it is your main stay with the most perfect of systems, but consider, in this age of specializing, would you not be better off and would not the individual departmental head or foreman be better off if you were to supply him with such information on expenses or where he stands on his output, or other details that are "*up to the day of looking at it*," so that he can control the situation to give you what you want.

The natural question becomes, can it be done? It can if you organize to do it. To organize to do it, means that you must assist that executive or foreman by training specialists to perform functions that are *at present part of that foreman's duties*, to do them better than the foreman can, by reason that these specialists concentrate on one particular object only.

Specializing needs no introduction, on our machines and operations we know a specialist can produce more than an all round man on work adaptable to specializing. We no more think of having the same boilermaker that puts a patch on a boiler roll in tubes than we would ask a tuber to put on a patch even if they do get the same rate. Therefore, I say for the reason that specializing cuts costs so it applies in management questions.

Without further discourse on the principles involved, I propose to give you a few concrete examples of how graphical production methods permit a specialist to perform functions that assist the executive by supplying information that is "*up to the day of looking at it*" that show "What is causing delays." or "What will cause delays." The diagrams I have made for the proceedings are for obvious reasons of size and

data made so as to show the principle. Colors are used on actual forms in order to create striking contrast.

### Locomotive or Passenger Car Repair Schedule.

Example No. 1 is a shop repairing locomotives. The methods apply equally to a Passenger Car Repair Shop. I have used that example because it applies to the repair shop arrangement proposition. It is applied at our own shops in the case of pasenger car repair shop and freight car repair shops in principle just the same as to locomotive repairs. *Our object is to assist all foremen to plan their work so that delays to output are minimized.* Analyzing the situation we find we have about 30 departments, all of whom receive some part of each engine or car to repair and on all of whom rests the responsibility of having it ready at a certain time when the process of erecting demands it. Based on the road report and a preliminary inspection our specialist, the scheduleman, in conjunction with the general foreman of the shop determine that it will require so many days to complete. This period is determined by adding together the time required on all the various detail jobs known. From past experience we have on this work developed a series of schedules from 9 to 30 days each, one of which is applied to each engine or car as the case may be as the work demands. The Locomotive Repair schedules are practically all based on one 18 day schedule, in that on all engines the operations for the first five days are practically the same, and for the last seven days also, they are the same; the space in between being taken up by the department having the excessive or special work to do, such as boiler work or special repairs where the time is an unknown quantity and is determined by each individual engine.

We now come to our first chart which we call a Master Schedule (figure 2.) The Master Schedule forms have detailed down the left side all the controlling detail operations or parts listed in the sequence in which they are required completed. At the top of the vertical columns we enter the engine or car number as each is taken in the shop, and then by the application of the particular schedule, on which each engine or car is to follow, we enter opposite the operation or part the date it is required completed or delivered. When this is done we take our second form called a "Date Schedule" (figure 3), which is identical with the Master Schedule except,

that instead of engine or car numbers at the top of the vertical column, we have all the days of the month, and we insert in the column for the date as entered on the Master Schedule the engine or car numbers opposite the operation.

This is done as soon as the engine or car is taken in the shop. By a four color code we record on both charts *every day* exactly what has happened, whether "on time," "shop late," "material delivery late," or "drawings late" in black, green, red or yellow respectively. This is done as follows: Each day at a certain time the schedulemen make a check of all shops, after which they mark up the Master and Date Schedules. Following this they make out from the Date Schedule for each departmental foreman, a list of operations due completed *to-morrow* and include on it especially marked all items that are late. This daily "order of work" sheet is delivered to each foreman the night before the day it covers, so that they can plan their work to cover every item. Incidental to this *a list of all late items* in all shops is prepared for the

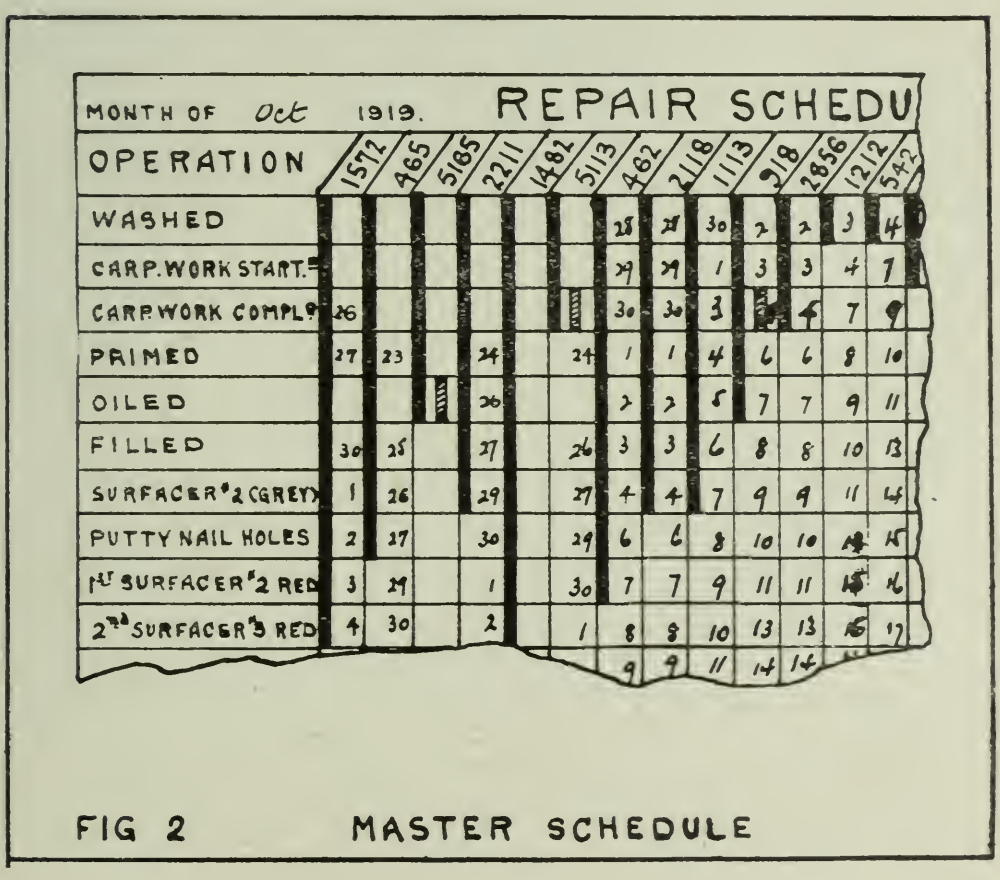



FIG 2 MASTER SCHEDULE

general foreman and superintendent's use in order that they may use their influence to prevent further delays. This is a very important function in keeping track of a large number of items. They can go to the vital points that are holding up the work.

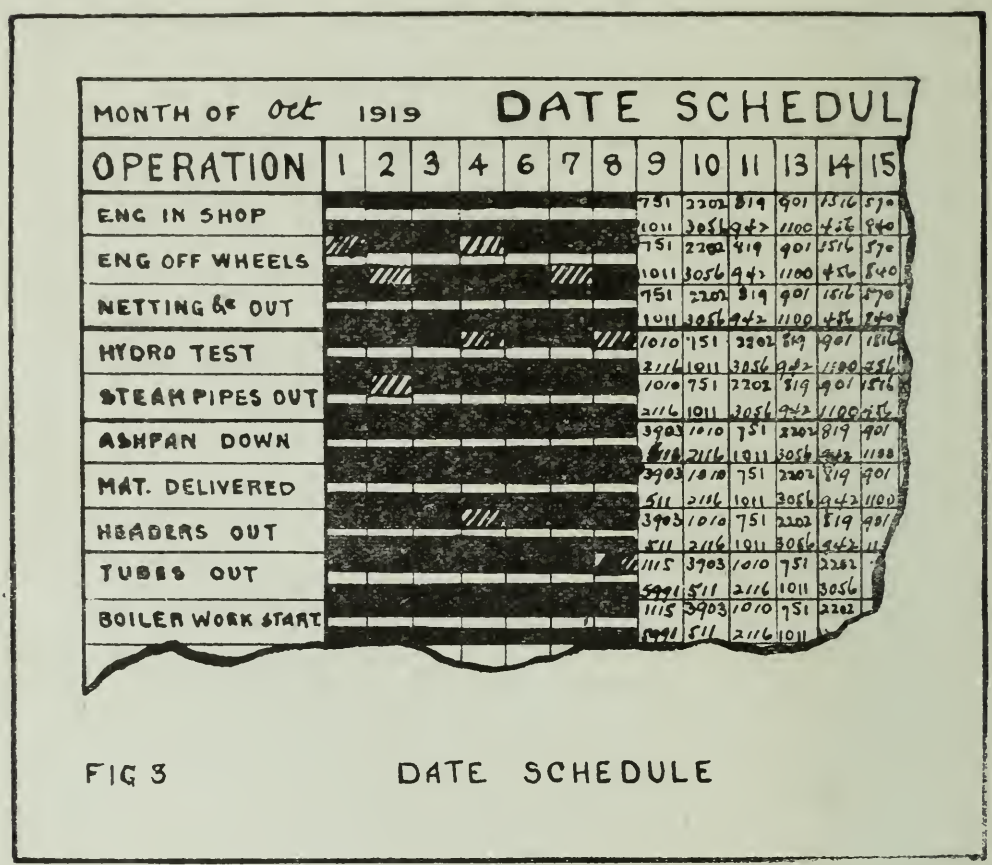



FIG 3 DATE SCHEDULE

Summarizing this example, we provide each departmental foreman with a list of work which must be done to-morrow; we provide a list of late operations and material so that delays may be investigated and something can be done early in the progress. We have before us a graphic record of each engine or car's progress, showing each delay, as it occurs and we have a graphic record of each day's progress from which weak points can be seen at a glance. The result of this performance is that we get a co-operative effort, because each department being familiar with the process realizes that the management knows what is going on and can measure each man's effort. It makes it unnecessary for foremen to leave their shops to

trace material, this being part of schedulemen's duties. Changes that occur when extra work is found necessary, causing a set back to the original date of delivery are automatically taken care of by the Production Department, that is to say, if after the engine has been in the shop for six or seven days and it is found it needs heavy boiler or other work which at times cannot be avoided, it is then necessary to allow it so many more days and the schedule is changed accordingly in all departments. The net result is a shorter number of days in the shop per unit, time between jobs reduced and lower costs.

### Locomotive or Passenger Car Repair Costs.

Example No. 2 may be considered a continuation of the first example in that it concerns costs. It is important that we know certain detail costs at current periods. Costs do the shop little good if they come when the job is complete and away from us. *Our proposition then is to keep track of loco-*

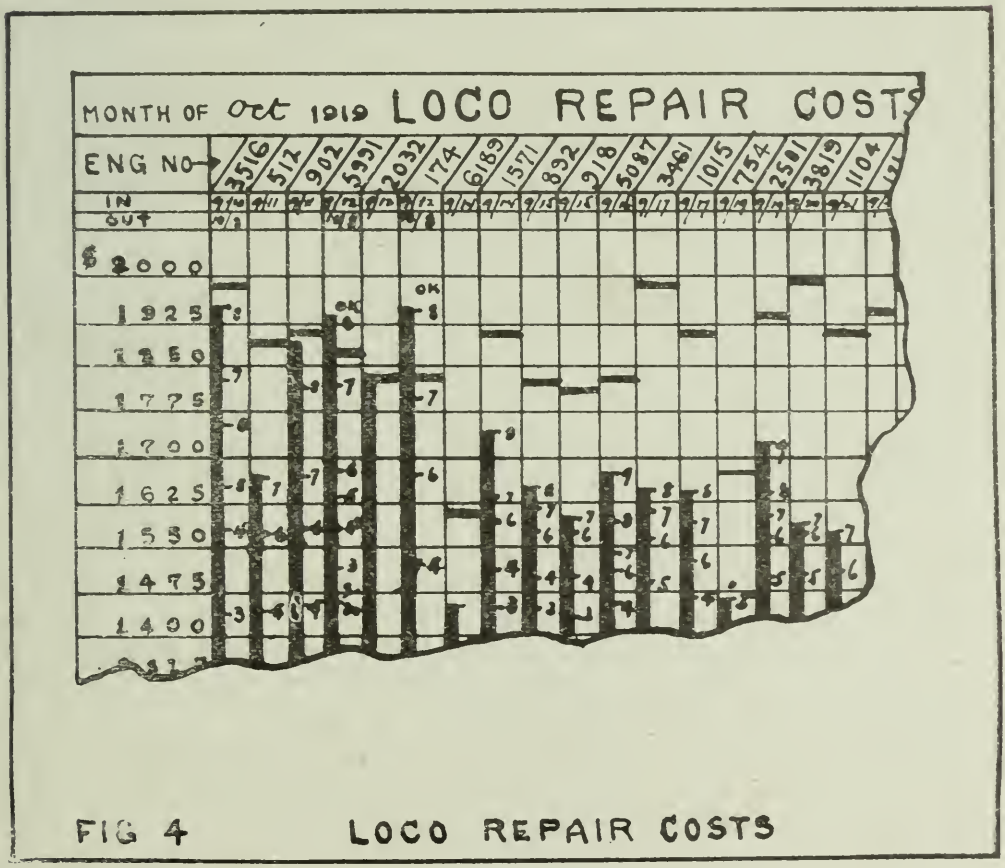



FIG 4 LOCO REPAIR COSTS

*motive repair expenditure in order to keep the cost right.* The method is suitable for all classes of work where average costs are maintained and used as a base for expenditure. It is not recommended in this form for manufacturing of a small, multitudinous, or varied nature.

Chart shown in Fig. No. 4 is a graphic representation of current locomotive repair costs. The method here also would apply to Passenger Equipment costs. On the left is a scale of dollars large enough to cover the anticipated range. Each vertical column is headed with the engine number, the date it came in the shop, and the class of repair it is getting is also inserted small for reference. By arrangements with the Cost Department these daily costs are given a preference and are supplied the second day after they are incurred an a special form for the purpose, and on the cost chart a black line is extended under each engine daily to show total cost to date. In each engine cost column a red cross line is drawn at a point opposite the estimated cost of the job. An estimate is made for each engine based on an average in the case of straight repairs, as soon as inspection is complete, and which includes extra allowances in the case of extra or special repairs. Now when an executive looks at the chart he notes particularly those that have gone past the red mark and by consultation with the Engine Master Schedule (similar to Chart No. 2) he sees what has happened, at the time it happens and the progress of that particular engine. He is then in a position to act if his judgment indicates the cost is abnormal.

It will be noted that short thin black lines extend from each engine cost line at more or less irregular intervals with a number close at hand. These lines are to indicate the amount added each day, and the number represents the date. We can thus see whether the labor expended has been irregular, or whether it is a steady growth. When you see them getting wider apart you know that probably double the amount of labor is going on that job. This indicates how much work is being done, and is worth while looking into because it shows that something is probably being held up somewhere and there is a delay liable to occur to the engine before it is finally turned out.. This is a clear indication of good or bad organizing in the shops. Very great use can be made of this chart. It shows poor distribution of labor in detaid and enable conditions that bring about high costs to be thoroughly analyzed and acted upon before the question is asked.

COST OF MANUFACTURED MATERIAL.

Example No. 3 concerns the efficiency and cost of detail manufactured material. Our desire is to *know the efficiency and cost of each order* up to date during its progress through the shops. The method described is used by manufacturing the shop while the job *is in progress*. We have not used this method in railway work yet, but it was used by a progressive industrial concern I was working for a couple of years ago. The very fact that your shop foreman knows where the individual costs are each day will tell him when the detailed cost is excessive and what it should be for the amount of work done. It puts him in position to find out what is wrong and the man who is responsible for high costs. It is applicable in a form adapted to railroad back shop manufacturing and is a real way to keep these costs right.

It consists of a Job Cost Sheet that is kept and entered up in the shop office. These sheets are kept in loose leaf book form and the duties of the cost clerk are to enter in the proper column from the daily time cards, the costs incurred the previous day. Thus by noon the cost of each order up to the previous evening should be entered. On each sheet is detailed the standard method of doing the job and the standard time allowed for each operation. This information is obtained from the Production Department who develop the correct method in conjunction with the Shop Engineer and foreman of the department, who, at the same time recommend such special jigs and tools as may be deemed necessary. When the order is a special one, that is, unusual or rare enough not to warrant making standards for further use a summary estimate is made up for each operation by the Production Department in order that a daily check may be kept on the job.

The duty of the cost clerk is to call the attention of the foreman or party concerned when the cost exceeds the allowance up to the point in progress the order has reached. We thus have a means of keeping our foreman posted up to date on the cost of each job at all points of its progress, not when it is done and too late for him to do something. That is quite a bit away from railway practice. The matter of entering time cards has always received first consideration from the accounting department because they believe that the very first thing necessary is to get the time of the men checked up. This is important, but when anybody is going to check up the actual costs then it is extremely important that we should

know about the cost because if we get the figures after the job is away from the foreman they are of no use at all.

### Major Account Expenditure.

Example No. 4 is a form that we use to show us graphically our unit and summary expenditures on major accounts. This type of form was developed by the late Mr. H. L. Gantt and used effectively to record progress of airplane and munition manufacture, also many other items in his work for the United States Government during the war.

We want to know *how our daily expenditure on each account compares with the allowance for the day,* also how our total expenditure to date *compares with the total allowance to date on each account.* The chart Fig. No. 5 contains one vertical column for each day of the month, over which the date is inserted. On the left hand side the name of each ac-

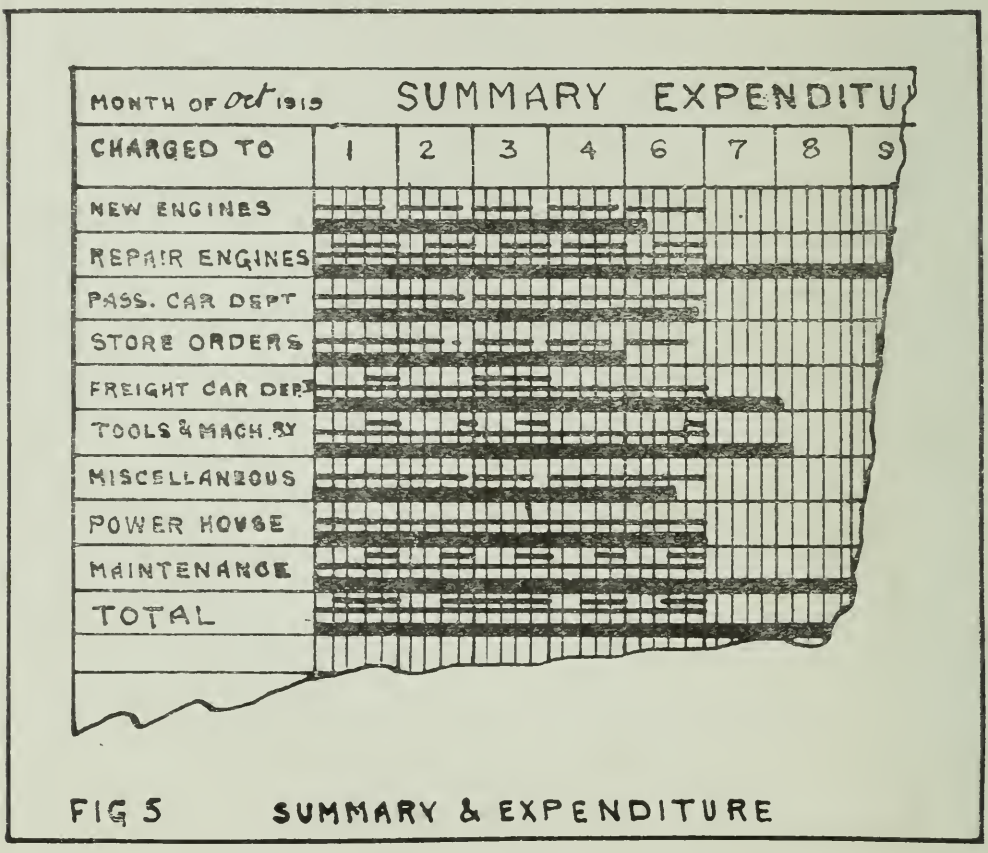



FIG 5 SUMMARY & EXPENDITURE

count is inserted. We then calculate the allowance for each working day of the month and enter it for reference on the right hand side of the chart. Now in making up the chart it must be understood that the distance horizontally between each date column represents 100 per cent or the allowance figure for the day on the right, and as your actual expense figures are received, you make a line across that space equal to the amount actually expended. If less than the allowance, this line will not cover the space, if more than the allowance an extra line over the one covering the space shows how much. Directly under this line representing the daily expenditure is a thicker line that represents summary cost to date. This line is merely extended daily by the same amount as entered under the daily cost column, except that it being no respector of dates, it shows by its total length whether the account is over or under expended to date. The comparative point being always the line of the date up to which the chart is entered. The chart Fig. 5 shows a sample of this form entered up to the sixth of the month. The top line on the account for new engines, the allowance or appropriation for the month has been divided by the number of hours in the month, which gives us so much expenditure for each day. The short line at the top indicates that we did not spend the allowance for that day, but the line gradually grows longer until by the sixth day note we have just expended the allowance. Th. thick horizontal line shows the total expenditure up to the sixth day. This chart shows a method that will apply in all cases where you have a limit to work to, for with it you are able to know whether you are working to it or getting behind. Mr. Gantl used this form for showing the output of machine operations and machines to show whether he got the regular output for the day or not. He showed up the efficiency of each individual and used them to locate poor workmen in order to study them, also to boost the good workman. He also used this form to manipulate his men, putting the man on the job who could do it best.

While this sounds somewhat complex it really is extremely simple in operation, and we have a complete record on each account of how much, when and on what account we have over or under expended. The chart is soon readable by anyone and shows immediately how close instructions are being attended to. As may be seen the idea is one of vast possibilities outside of costs, where unit and summary data is required.

### Building New Equipment.

Example No. 5 covers the manufacturing of new equipment such as locomotives, passenger cars or freight equipment of any description. Here a new element demands first consideration and that is raw material, the source of which we do not control. It goes without saying that the shops can make no progress without material and drawings. Therefore, we require practically all the items that are not stores stock to be included on our schedule for erection. Material that is regular stores stock requires to be checked at definitely determined periods before it is required for erection, but by reasons of the number of items are usually followed on a special chart. It is essential, however, that all castings and all purchased material be listed on our erecting schedule. Our object is to *complete so much equipment at a certain date.* On the Master Schedule Chart (shown but not printed in proceedings), we list all these parts on the left hand side, and head all our vertical columns, which cover a period of three months, with the date. We insert the completion date at the point the first unit is required completed and working back from that date for each item, we then insert the date each item is required completely machined ready for erection. Then from each of these dates we compute the necessary time for machining each item which gives us the date raw material must be available. After this we take into account the necessary time to deliver patterns, and to obtain material from Brass, Steel or Grey Iron Foundry or other source from which material is obtained, and thus we arrive at the date drawings must be completed. All these dates are marked plain on the chart and the parties concerned given a copy of the schedule. The whole form represents what must be done in order that the final completion date be made. It does not matter if material arrives before that date, but a certain time before each item becomes due our schedule tracers commence to trace the party concerned in order to prevent avoidable delays. Each day as it passes, one date column is filled in with the proper color to represent whether item is "on time," "shop late," "material late" or "drawings late." Black represents "on time" in every case and green, red and yellow respectively represents late on the other items. This color scheme is standard on all charts and a clear indication at all times is available of the general condition of the order. A permanent record is incidentally available showing reasons for delays which places the responsibility where it belongs. It also shows much

good matter for consideration when future orders are being placed. Its chief value to the shop is that it shows what is due to be done each day, and shows at a glance, how the material is coming along and how dates are being maintained so that the shops can be organized accordingly. We are able very definitely to advise the management months ahead, that for the reasons shown, a change in program may be necessary. Also the necessity of prompt action is vividly shown, when delays in initial stages have occurred. We use this system on all our new equipment programs with very good results.

### Detail Operation Schedule.

Example No. 6 is a method used by the author to plan the work for every productive man and machine in a department. The object is *to provide the shop foremen with information as to the "next job" for every man.* Figure No. 7 is a diagram of a shop "control" board which consists of a board containing a separate slot for every man or machine, the identification being down the left hand side. As each order was received by the Production Department, a ticket was made out for every operation equal in length to the time allowed for each operation. The tickets are made on 20 to the inch profile paper, each division representing one hour. The board is black, and white lined vertically at weekly intervals. In the top slot is located the date strip, showing days of the month covering the period covered on the board. All the work for the shop is represented on the board, each operation being located in the proper slot. When material is available, each operation from the first to the last, is located in the respective slots at the date so that time between operations is at a minimum, taking into account also the continuity of work in each machine. Simultaneously with the making of the control board tickets a job card is made for the shop foreman's office board. This board contains a compartment for each man, and the cards are arranged to correspond with the Master Control Board with the "next job" card always in front. As each man nears completion of his work in hand his gang boss goes to the board and takes the next job ticket, and gets the material to the machine together with the necessary tooling equipment. The card stays with the work and then goes to the inspector, who after inspection passes same to cost department. This system plans the work in great detail for the foremen. It shows when machines are overloaded, when idle due to breakdown, man absent, or out of work, all points of vital

interest where costs and delivery are of prime importance. A summary is made of all this data each day and it is somewhat remarkable when you get these totals. The amount of idle machinery that is sometimes shown.

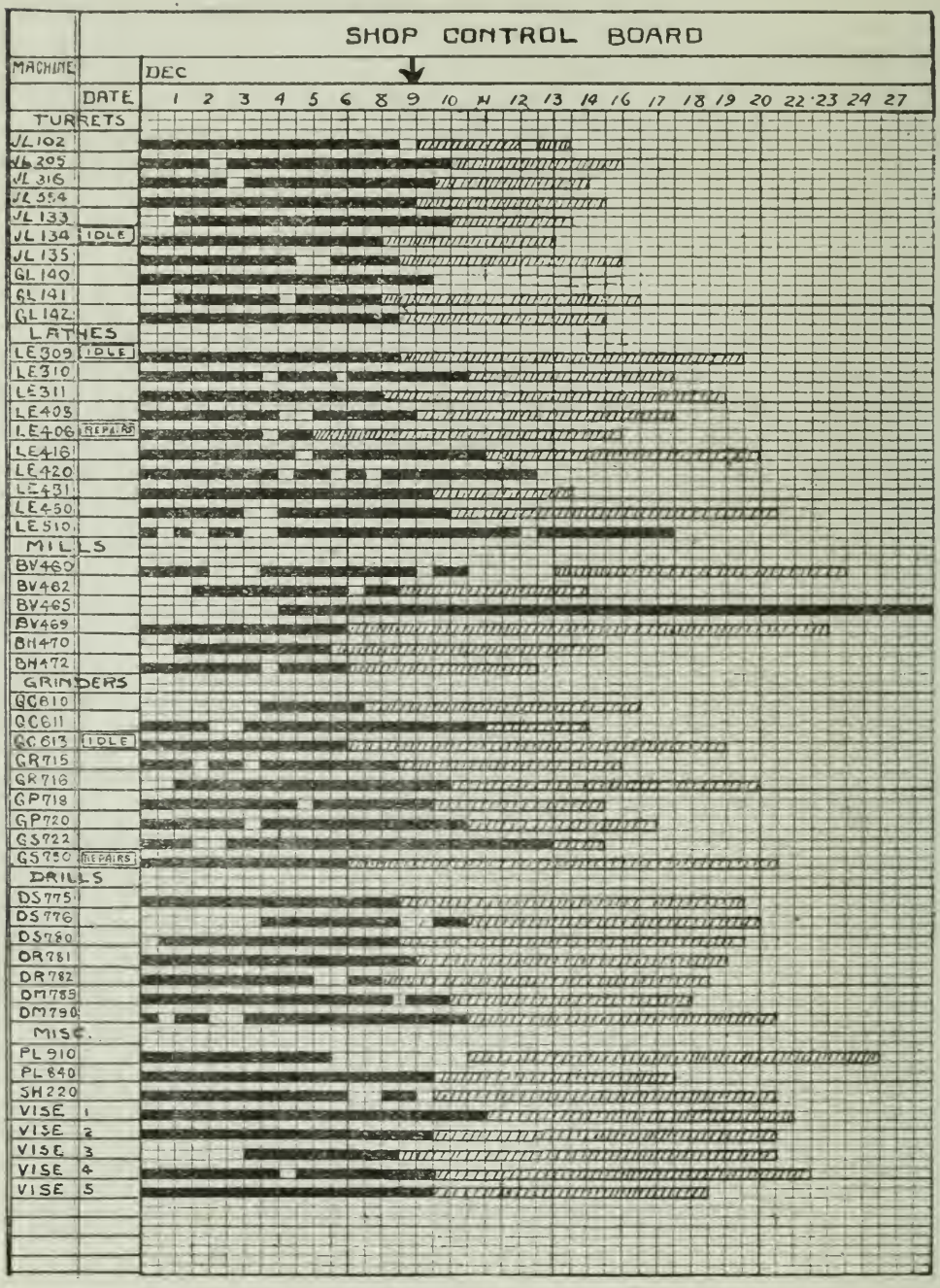



FIG. 7.

The scope of this paper does not allow of going into the detail of this system more elaborately, but it is a point to be noted particularly that the most successful commercial concerns of to-day find that it *pays* to plan this detail by means of a specialist Production Department.

## Conclusion.

In conclusion, I want to point out one fundamental principle which you may have noticed in all these methods. In every case a *standard or task is set as the object to be attained* and that standard is set at the beginning of the job. All the methods provide a means of knowing whether the standard is maintained at all points in the progress up to the completion of each particular task.

You will also note that I have preceeded each example with a clear statement as to the object to be attained by each method. This is very important on account of the multiplicity of detail which has to be dealt with and which will often lead one "off the track" unless steadfastly maintained.

Last, I ask you to note that while all this *looks* like so much statistical, clerical and accounting, it is an entirely different thing. The viewpoint is not that of an accountant, nor could it be handled by an accountant, it is distinctly a management engineering proposition for an engineer.

The principles outlined in this paper have been adopted by the management of the C. P. R. in the creation of a special department called the Production Department attached to the chief executive of Angus Shops to develop this work. It is a distinctly new department for railroad shops and credit must be given to Mr. W. H. Winterrowd for recognizing that there was no logical reason why methods of successful business institutions should not be incorporated into railroad shops. To the best of my knowledge the Angus Shops are the only railroad shops on the continent that have such a department that is operating as a separate department with full confidence and co-operation of the supervising staff all working for one result. All Foremen, General Foremen, and other supervisors realize that one department, acting as a sort of clearing house for all material can render better service than was possible when they each had to chase their own material from shop to shop. They equally recognize that when a certain output is required, that the special de-

partment can advise what operations are to be done each day, can advise on all items late, and state what must be done daily so that the final result is what is required, because it has more complete information than any one department could possibly have or get. In all cases the basic schedules are developed by or with the departmental head concerned so that he feels that it is his schedule and he consquently realizes that he is being helped and actively assisted by the management. We always make this very clear,—that in each shop the foreman has an active interest in the development of every schedule. If any new work is to be undertaken the head of the department applies a schedule which he knows will be workable so that when it goes into effect the foremen will support it and not feel that anything is being forced upon them.

(Here Mr. Spidy exhibited various charts from actual service covering: Repair Engine Schedules, Passenger Car Repairs, 28 Hr. Freight Car Repair Schedules, Loco. Detail Costs, Summary Expenditures, New Engine Schedule, New Flat Car Output Schedule, Freight Car Material Check Chart, Passenger Car Material Check Chart, Store Order Schedules, and explained them to the members.)

Chairman:

As the Secretary has stated on the post-cards sent out regarding this meeting, the paper throws a new light on railroad shop statistics and methods of controlling production by the means of graphical charts which are simple and practical in operation. We should have a very full discussion on this subject. Perhaps some of the members may wish to ask some questions. The meeting is now open for discussion.

Mr. L. C. Ord:

After Mr. Spidy's remarks it is possible that some of the members may think, from the amount of color on the charts, that this subject is a complicated one which requires considerable staff and considerable work. I would like to speak about that first. It requires a very small staff to operate, as in a shop of 2,500 men the total additional staff required to handle this would not be more than four or five men, and with this 50% increase should be obtained in the output without increasing the supervision. This method of control also looks after the movement of material, and in a

shop, large or small, it is a familiar sight to see the foreman who should be watching his men, chasing over to the Stores or elsewhere, looking for material which he is short of. Under this system the chasing of material is done by one man and the foreman stops moving from shop to shop. The same condition applies where there are several shops handling the same material. One fellow knows that the Stores has something he wants and he goes and gets it, but with the schedule man watching, the delivery of material is checked up, and he sees that it is distributed to the shop as required. Where large quantities of material are used for new equipment the tracing proposition is serious, and in the case of some items it is handled in bulk. We carry considerable stock ahead and as the supply begins to run low the check is repeated every day until it is received. This system shows the number of days the shop has been out each class of material. The party concerned is supplied with a list of the outstanding material that is short and he can act on the situation. The staff required to do this is extremely small and the men who specialized on it does more work than several foremen. In any large shop where any special work is required in a hurry nothing gives a quicker answer than a schedule. This schedule is not a new method. It is equivalent to putting a lazy man on the basis of a good man. The older experienced foremen planned his next day's work the day before. He knew what he had to do and did not wait until the morning to assign his men to their different work. He wrote up the list of what was to be done and told his men to do it. Various foremen had different methods. This system writes up the list for the foreman the night before and gives it to him in time to assign men to the jobs for the following day, and the men do not work one against the other. This is not now, but in making a chart you have a definite and uniform method and with a large staff every man knows it in time.

In a shop where you put four or five men on a car or engine and have some working on the wheels and some on the other parts, if the men could do all the work it would then be a simple matter to take the material as it came along, but the modern shop is gauged up to its maximum and each man specializes, and it becomes more difficult to see that each man gets off the job in time for the next man. The schedule puts that in the hands of each foreman as it indicates whether any one shop is late repeatedly or whether it is ahead of time.

In almost every shop where a job is started a different

schedule is required. You do not start off and find out later where you are going to come out at. Before a foreman starts a job he has got to make a definite plan of how he is going to do the work, and then he is checked up to see that he carries it out. His plan can be checked up in detail before he starts out and you know how closely he lives up to it. By checking the work and your layout you can see that distribution is controlled before the job starts and each schedule will bring better results later on. The last point is that it does insure uniformity of output and a certainty of operation that cannot be obtained in any other way.

Mr. A. McAlpin:

Production by schedule has been so clearly stated that, to shopmen at any rate, questions seem hardly necessary. That is as far as the paper goes. But there is one thing not mentioned in the paper that at the present time has a distinct bearing on this paper and in the future may have a still more direct bearing. These schedules have all been based on an output under a piecework system, or one might say on an accelerated labor basis. As the Canadian Railroads have accepted the McAdoo Award and as one of the clauses of that Award decrees that where the men rate a majority against piecework, it automatically shall cease to exist. I would like to know if Mr. Spidy can enlighten us as to how we are to keep up the labor pace to fulfil the requirements of present schedule.

Mr. E. T. Spidy:

You ask what would happen to the schedule if the piecework system fails. At Angus Shops piece-work is in force which accelerates the output of the individual and this would, in a way, affect the schedule, but the schedule in itself is entirely independent. Should piece-work be discontinued the check we get on individual operations by the piece-work foremen would also be discontinued. We would still have, however, in every department the check which is made by the Production Staff in each shop. Should piece-work be discontinued a certain number of the piece-work staff would probably be absorbed into supervision, which would provide extra foremen to check up the work and see that it was done. My own opinion is that a shop without piece-work requires a production schedule that is more extensive than one which has piece-work, because that provides the only individual

check on the work. Just how one is going to prevent a slow up in the output is a matter the supervisors will have to handle, but if you provide the supervisor with a list of work required each day he has something definite to work to, also the management has a definite check every day, it can be readily seen when he is falling down and where. The schedule will tell you exactly how your shop is being run which will give the necessary stimulus to get the output.

Chairman:

Are there any members from the Grand Trunk or the Canadian National Railways who could give us some more information on this question?

Mr. W. Blackbird:

I do not believe I can say very much upon this question, as I do not consider that our system on the Grand Trunk has very much bearing upon the system as explained by Mr. Spidy. On the Grand Trunk we have a system of Contract which, while it perhaps does not control the output in the same manner as Mr. Spidy's system, gives a stimulus to the men. By having a system of time allowances based upon the average man's production, the man that is capable of doing a little better, by the extra effort earns bonus. It has proved to be of very great assistance in maintaining the output especially in Car and Motive Power Depts. work.

Our Schedules are all upon a Time basis, and if a man produces an amount of time which exceeds his actual time worked, the excess time, at his hourly rate in the shop, represents his bonus.

As I said before I do not think the systems are comparable.

Mr. W. H. Sample:

I would like to ask Mr. McAlpine if he has had any experience working with a schedule on piece-work or working on a stated hourly basis, and did he make a comparison of the results?

Mr. A. McAlpin:

I will have to answer in the negative. I am employed up

at the Angus Shops and our output is on a strictly piece-work basis.

Mr. J. Burns:

I do not think we can compare this schedule with piece-work as it is an entirely different proposition. As Mr. Spidy explained, the intent of the schedule is to plan the work out so that each unit comes in its proper course and delay is thus avoided. When we start to build locomotives or cars we have to have designs or drawings and after that the patterns have to be made and castings and other materials produced. The schedule is framed so that each article comes along in its proper turn. The piece-work has nothing to do with this. Of course, the piece-work or bonus system has to do with the output, but the schedule has to do with it in a different sense. We all know that material coming from the blacksmith shop or the machine shop, if not delivered in time will finally cause delay in other parts of the shop. If we are to receive steel castings from the outside stores and they are not delivered, and we have a boiler ready, that boiler has to wait until we get the castings. This is where the schedule shows its proper use. Anyone who has seen it operate will certainly know that in large shops it is an absolute necessity, and it can be used in any shop, but in large shops especially where so many different departments are producing or require material it is necessary to insure that no delay takes place at the different parts of the shop. There is one thing we have found and that is that in our shops where we manufacture parts for locomotives and cars and also manufacture material for outside points on the system, the machine shop foreman gets orders from the Stores for material for outside points at the same time that he is supplying material for the erecting shop, and if the foreman of the erecting shop is waiting for the material, and the man at the outside point is also waiting for it, then somebody has got to come in between who knows where the material should be supplied to first. The schedule man has a schedule for that material and he knows the time the material is to be delivered. He has the matter in hand and can deliver to the stores, also at the same time produce the article for the erecting shop, in time to avoid delay. If we did not have a schedule to know our actual requirements we would not know what to do. When you take the system all the way through,—it helps both the foreman and the supervision in handling the work. Each one knows just what

is required and can bring pressure to bear at the proper time to get the desired results.

Secretary:

Mr. President and gentlemen. I notice that considerable mention has been given in the paper about the drawing office. As a general rule the drawing office comes in for very little credit. I remember my first boss, the late Mr. George Holland, saying that if anyone came in for criticism it was generally the drawing office,—go anywhere you will; it is just the same,—the drawing office is the bumping post of every mechanical institution. I want to say right here that after going through this paper and considering the subject I am satisfied that everything hinges on the drawing office. This department must prepare the designs and drawings before the patterns can be made, and the foundry, machine and erecting shops are all more or less dependent on that office. I said to one of my principals a short time ago that as a doctor is to the patient so the drawing office is to the shop foremen and men, and, gentlemen, I make that statement without any fear of contradiction,—I notice that some of our friends down there seem to take very kindly to that. While on my feet I think it would be in order,—as I have been in personal touch with Mr. Spidy for the past week or two in connection with this paper,—to propose a hearty vote of thanks to him for his excellent paper.

Mr. W. H. Winterrowd:

Before that proposal it put before the meeting, I should like to say a few words if I may, *from a broad, or general standpoint,* in reference to this subject. In all fields there has always been incentive to produce efficiently and economically. During the past few years that incentive has become greater and I do not believe that we have ever had a greater incentive than we have at the present time to produce efficiently and economically. The greatest majority of successes have been accomplished by individuals or groups of individuals who have had a full knowledge of all the facts which they have had to contend, all possible steps having been taken to eliminate uncertainty.

By means of the system which Mr. Spidy has described to-night, all or the greatest part of uncertainty, or guess-work is eliminated. This system puts facts into the hands of the man or the men who have to use them, and with this knowledge and within the sphere described it is possible for them to carry out their work in the best and most efficient manner.

Mr. T. C. Hudson:

I take great pleasure in seconding the motion that a hearty vote of thanks be extended to Mr. Spidy. I think it would be unwise for the officer of any other Road to attempt to criticize this System which is more or less new in many respects. In the Canadian National Shops the output and cost of repairs is watched very closely. It is true, as Mr. Ord has pointed out. that any supervisor in a shop must always look ahead and plan the work that is coming next; but with the aid of these charts the foreman knows each day just what is expected of him, and at the end of the day, just what he has accomplished.

Whoever allowed this paper to come before the club is to be commended, because there are many good points in it worthy of consideration, and it is right to bring before the club anything which is good, and which will bring about increased production, as there never has been a time when increased proruction was more necessary than it is at present. We have heard the members speaking about day-work and piece-work, and it brings to our minds the fact that if there is one thing we need to fear, it is the tendency which exists at present to do a smaller day's work, and, gentlemen, we have to deal with this thing pretty soon or we are going to suffer. The European nations are organizing to increase production and we must get our "thinking caps" on and study local conditions in order to produce more. It is equally to the interests of the working men to consider this matter also. It will be necessary to get together to bring about the desired results. If these charts will show the workmen what they are doing, at the end of the day, they will be a benefit.

I can remember the time when there was keen competition btween the little shops and the big shops on the C. P. R.

and in those days we used to set a good pace for Angus Shop. I am glad to see that they are using the chart system to increase efficiency.

Mr. Norman Holland:

As a manufacturer I should like to add something to Mr. Booth's remarks about the drawing office. I do not think he boosted the drawing offices sufficiently,—the men would not be able to "draw" their pay if it was not for the drawing office. With reference to this schedule; in the management of any modern business you must have something to work to, and the question of day-work of piece-work is not a feature of the case. You cannot run any business unless the men know what they have got to turn out. The question of piece-work or day-work does not enter into it.

Chairman:

Gentlemen, it has been moved by the Secretary, seconded by Mr. Hudson that a hearty vote of thanks be tendered Mr. Spidy for his valuable paper.

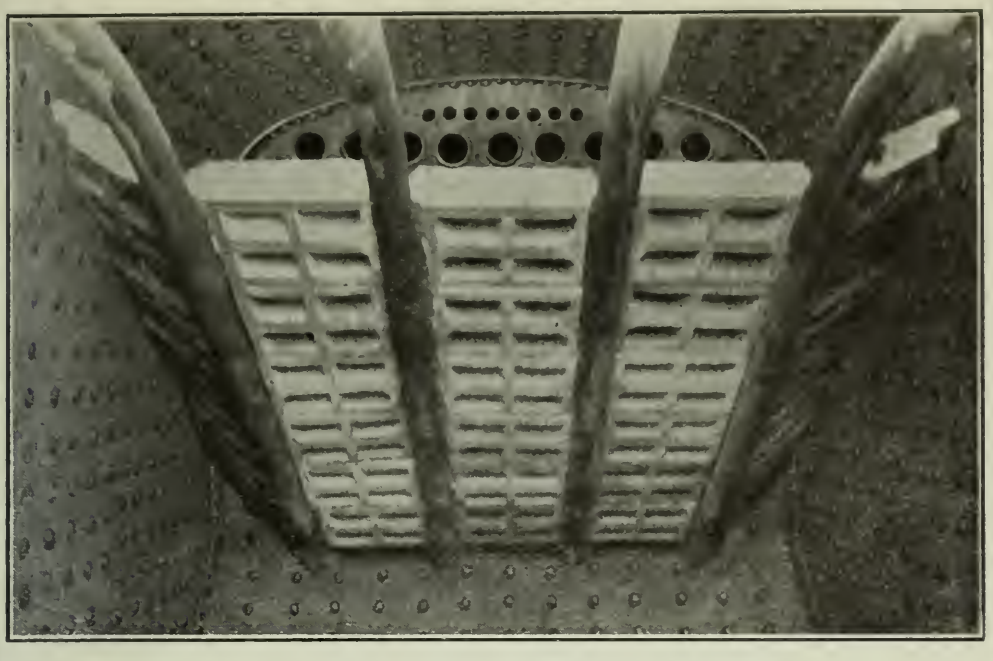
Carried. Applause.

Mr. Spidy:

Mr. President and members, I thank you. With regard to Mr. Hudson's question as to how the estimates are arrived at. In the case of locomotive repairs, we have the average costs for the past few years, and as a rule, the class of job is one which has been done so many times, that it is pretty well known what it should cost, and we use these averages to form our general basis, but the general average is only good in the case of straight repairs, if a job is extra big we add a certain percentage to the average cost to make our total estimate. In the case of individual shop costs we estimate on the straight piece-work basis. We have prices for each job, and by simply adding up the different operations we get the total cost of the job in that shop. *Schedule work cuts the time between jobs.* Piece-work concentrates on the job itself. The schedule aims to cut out the lost time.

Chairman:

The Secretary has arranged for some light refreshments in the room at the rear. We shall be glad to have you stay and partake of same.



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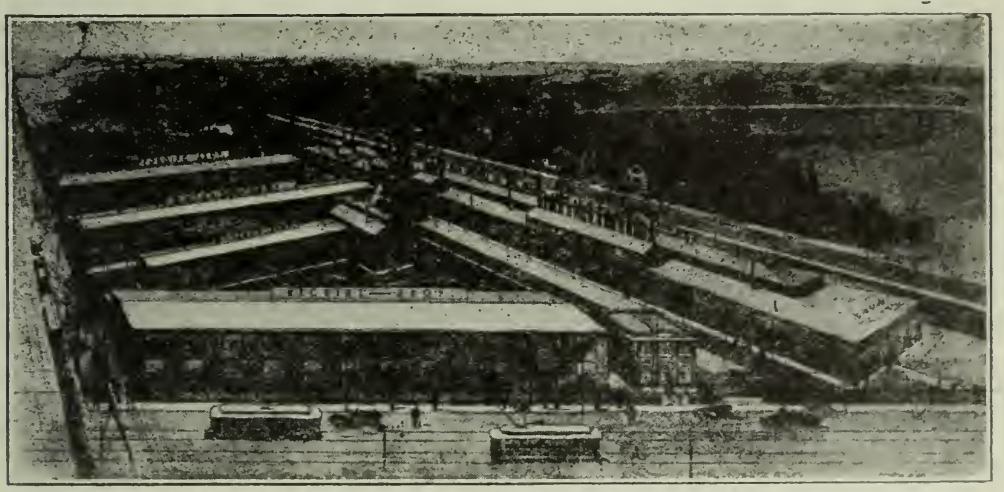

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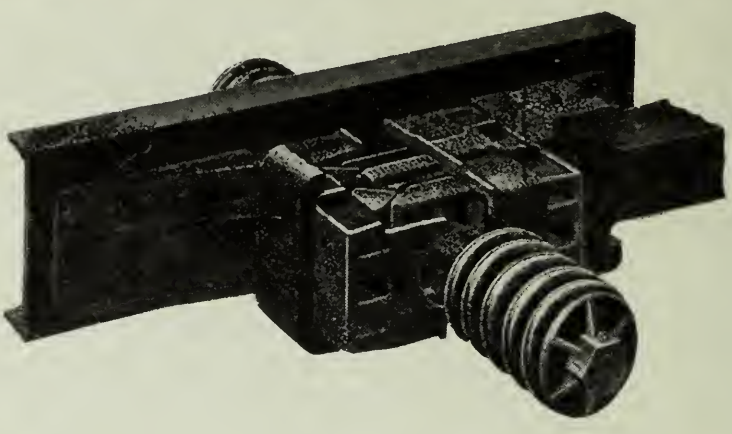

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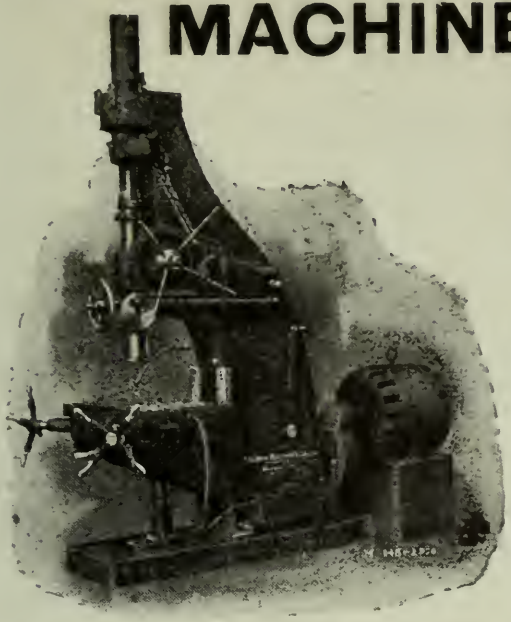

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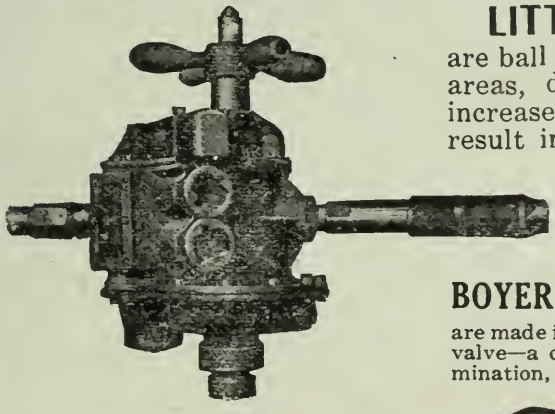

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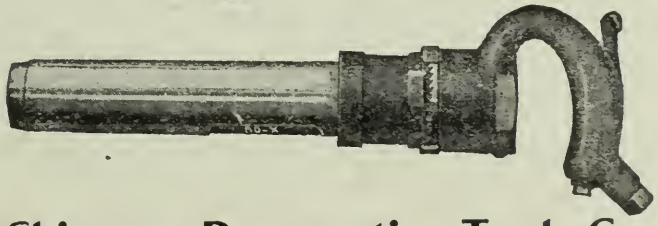

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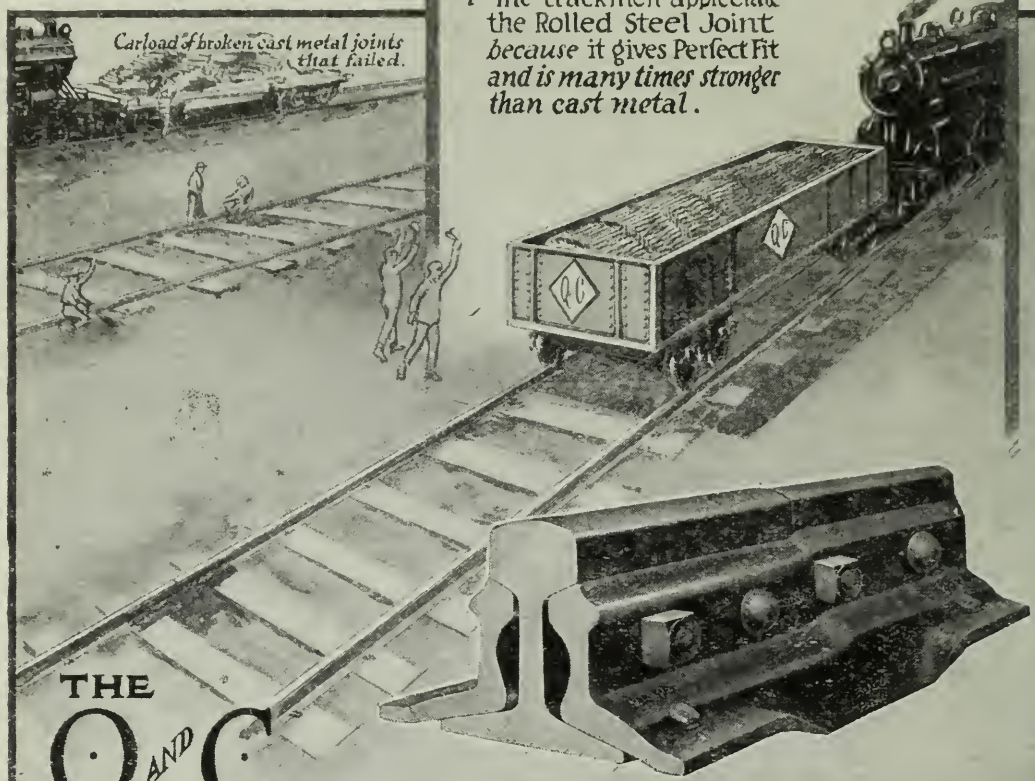


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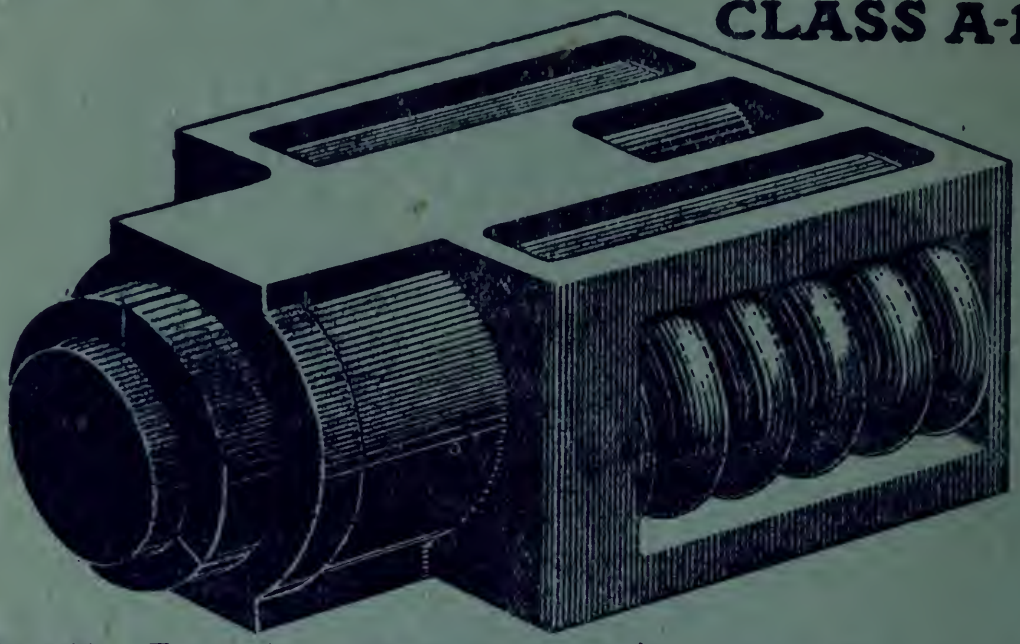

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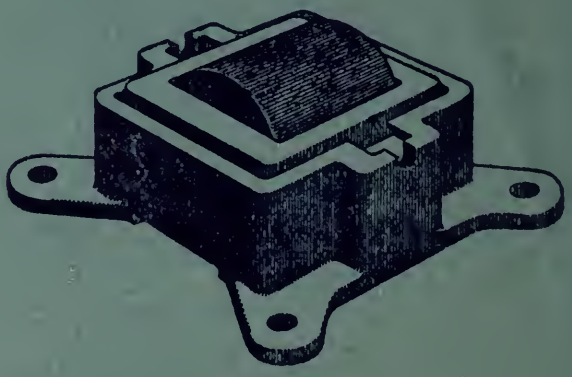

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